

Casebook: A System for Tracking Clinical Encounters

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ABSTRACT

Casebook is a clinically oriented database, written in MUMPS, and designed for recording the clinical encounters of medical students at Harvard Medical School. Its main goals are to 1) increase student use of computer technology, 2) help faculty evaluate the diversity of clinical experiences on their service, 3) provide data to the faculty on the "typical" experience of medical students on their service to aid in the evaluation of the curriculum and, 4) provide report-generation capabilities for the students to improve dialog with their preceptors. Students are able to enter information on "Problems" and "Procedures" selecting from a pop-up menu of medical terms or by entering free text. Casebook is currently in use in the Medicine, OB/GYN, Pediatric and Ambulatory rotations. At sites where the faculty take an active interest in the use of Casebook students perceive it to be valuable and subsequently use it more frequently. It is currently being expanded for use by medical students in their second, third, and fourth years of school.

INTRODUCTION

Casebook is a clinically oriented database, written in MUMPS, and designed for recording the clinical encounters of medical students at Harvard Medical School (HMS). The project was originally conceived in response to a number of perceived needs on the part of medical students and faculty. First, computer-based systems are becoming increasingly common and increasingly important in medical practice, and it was considered essential for students to have some exposure to this technology during their training. Second, the database would allow faculty to assess the scope and diversity of the cases seen by their students, and help them identify any subject areas in which the students did not receive sufficient experience. Supplementary experiences and/or computer-based patient simulations could be used to enhance these areas. Third, by aggregating data from all clerkships over time, the faculty could quantify the clinical experiences of a "typical" medical student and, if appropriate, modify the curriculum based on the information obtained. Finally, the system could provide report-generation capabilities which would allow students to

produce neat and legible reports for discussion with faculty preceptors and for inclusion in the patient record. Casebook would also allow students to do searches and produce summary reports on all of the cases they had encountered during medical school.

HISTORICAL BACKGROUND

The need for better monitoring of the clinical training experience at HMS was well recognized, and the idea of the Casebook system was suggested, early in the planning of New Pathway Information Technology effort (1984)[1,2]. Prior to Casebook some faculty members tried to collect these statistics using a small paper booklet. After seeing a patient, the students were asked to jot down the appropriate information, and at the end of each rotation, the student would drop off the booklet at the department office. Although many students actually filled out this form, it was impossible to provide timely feedback on the student's clinical activities. Additionally, there was the disadvantage of requiring either a secretary, or the faculty member interested in the information, to read through each booklet and collate the statistics. The inevitable result was a large stack of paper booklets sitting on a desk, growing larger every rotation.

The first version of Casebook attempted to collect a large amount of data and required entering information into many different fields on a multi-screen form. This made the system slow and took too long for harried medical students to complete. The original version also attempted to use automatic transmission via telephone lines to transfer the data from the local PC at each rotation site into a master database at a central site. This transfer would occur at the end of every session. Unfortunately, many of the sites did not have phone lines and the information received was frequently full of errors. Based on these experiences a series of modifications and enhancements were made. 1) The interface was streamlined so that only information deemed essential was entered by the students, with the entire form on one screen. This greatly decreased the amount of time needed to enter a new case. 2) Each rotation site received a faster PC (386 vs. 286) and the data was stored locally to obviate the need for telephone transmission of data. This im-

proved the speed and reliability of the system but required an administrator to copy the data to a floppy disk at the end of each rotation and mail it to the Information Technology (InfoTech) staff for inclusion in the central database. 3) Finally, a notecard option was added to the system. This allows students to print a 4x6 card containing summary information on a patient. This was intended to replace the index cards containing patient information that are found so frequently in the coat pockets of medical students and residents.

This updated Casebook system was put into use in the OB-GYN and Pediatrics clerkships at HMS during the 1989-90 academic year. Medicine and Ambulatory Medicine rotations were added during the summer of 1990. We continue to make updates and enhancements to the system in response to user feedback and experience with the system.

CURRENT STATUS

Currently, the system is installed on 15 Hewlett-Packard Vectras located throughout the different Harvard Medical School affiliated hospitals, and on several machines in the Medical Education Center at HMS. Each rotation site has a single computer that has a variety of medical education programs, a word processor, DXplain [3], and Casebook available for use. The students are required to enter their cases, at their convenience, at some point during the rotation. This is frequently done only once a week during the Ambulatory rotations since the students may work at different locations throughout the week. On inpatient rotations the students usually enter their cases on a daily basis since the computer is more accessible to them.

The student's perspective

After starting Casebook the student is prompted for a password that has been pre-entered by the rotation administrator. This automatically brings up the data entry screen (Fig. 1) with the entries for rotation type, location, and student name already filled in. The student then enters the patient's name, date of visit, age, and sex. When the student moves to the "problems" field, a default pop-up menu appears with a list of "required" problems that had been previously selected by appropriate course coordinators. The student may select a term from this list or enter free text. The concept of a "required" problem is somewhat of a misnomer, since the faculty obviously can't require a student to see a problem if no patients present with that problem. However, it was felt that if the students did not see certain problems, extra effort would be made to arrange an appropriate clinical encounter, or the discrepancy could be dealt with by having conferences or discussing cases involving these problems during rounds. The "procedures" field follows, with data being entered in a similar fashion to the problem field. Finally, there is an optional "notes" field for entering narrative text.

Additional features that the students can use include a report generator that provides the students with a list of problems, procedures, or patients they had seen during their current rotation. This can be viewed on the computer monitor or printed out. A notecard printer is also provided so that all the information for each patient, including the notes field, can be printed on a 4x6 card for the students to carry with them. This provides a very convenient method for the students to keep track of their patients and activities planned for them. Previously en-

Record Number:		Form: Case Encounters	Page: 1
Rotation:	Medicine	Rotation Location:	MGH
Rotation Date:	AUG91	Student:	Smith, Jane
Patient Name:	Sanders, Dortha	Age:	54
Date:	8/12/91	Sex:	Female
Problems:		Procedures:	
Anemia*		Arterial blood gas*	
Pneumonia*		Electrocardiogram*	
Asthma*		IV insertion*	
Angina, Stable			
Notes: Discuss DNR with patient's husband.			
Press <TAB> to move forward or <SHIFT-TAB> to move backwards Save Edit Ctr Disp Delete Reports Notecard			

Figure 1. Sample entry screen with fields filled in. The asterisk following an entry indicates a required term.

tered cases can also be reviewed and easily edited via a patient lookup function.

The faculty's perspective

In most of our teaching hospitals the Ward Attending meets with the medical students at least once each week for feedback. Frequently, the students are requested to print a summary of patients, problems, and procedures that they had entered into Casebook, and bring them to this weekly meeting. In addition to the individual reports that the students can print, the faculty have the ability to generate aggregate reports for all students during that rotation. Further sub-divisions are available, including a listing of only the required problems and procedures, or all of the problems and procedures including the non-required items. Faculty can provide case-by-case commentary as well as review overall progress by using these reports. Note that the procedures may depart from traditional medical skills to include bibliographic search via computer, visit to a daycare center, etc. Students are thus provided a very concrete measure of their progress in meeting the clinical objectives of the clerkship. Any students having difficulty achieving these goals can be quickly identified and directed to appropriate opportunities early on, instead of discovering these deficiencies at the exit interview. Furthermore, the clerkship coordinators learn over time which clinical material is unlikely to appear on their service and can devise case simulations or other experiences to fill in the gaps. On those services that use a final examination for evaluation, Casebook ensures that all students share a reasonably consistent clinical knowledge base going into the exam. In addition, the faculty are sent a complete set of reports at the end of the rotation, detailing the usage of the system at all of the institutions involved in a particular rotation.

The local administrator's perspective

Prior to the start of a new rotation the designated administrator (typically the departmental secretary) enters new passwords for all the students. This process links the student's password to the student's name, rotation type, and rotation location. The only other administrative responsibility is to run weekly backups of the hard-drive and to send the completed data to the InfoTech staff at the end of a rotation.

Statistics on use

Currently, Casebook is in use for rotations in Medicine, Pediatrics, OB/GYN, and Ambulatory medicine. The statistics we have so far tend to corroborate the comments we have received from the students. At sites where the faculty take an active interest in Casebook, and ask for weekly or semi-weekly printed reports from students, participation approaches 100%. At

sites where the faculty have little interest in Casebook the usage is much lower (figs. 2,3). (Note in figure 3 there were no students at certain sites for some of the rotations.) Of those students entering cases, the most active rotation is OB/GYN with an average of 46.7 cases entered/student during a six week rotation (fig. 4).

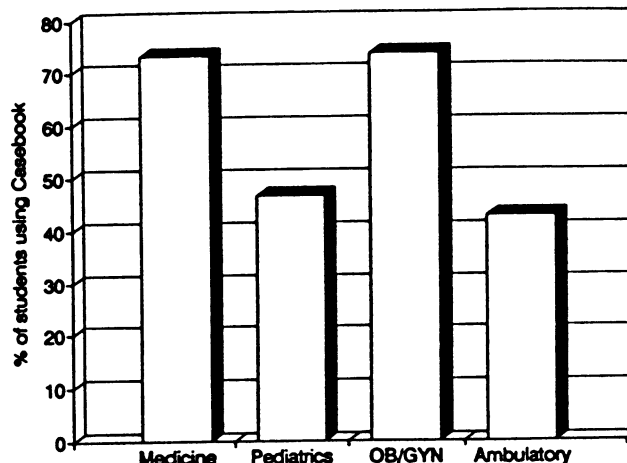


Figure 2

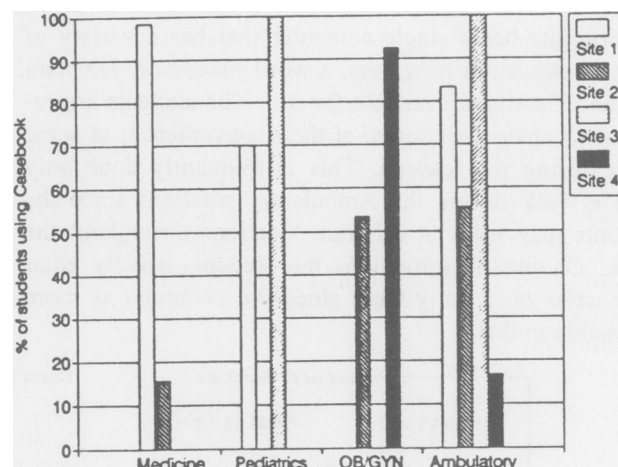


Figure 3

VOCABULARY/INTERFACE ISSUES

The original "required" vocabularies for each of the rotations were obtained from a list of problems and procedures that each department felt were essential for medical students to observe during their respective rotations. These lists are hierarchical and terms that have children are so indicated. When entering data, the student can select as many appropriate terms from the list as necessary. S/he is then allowed to enter narrative text terms for problems which are not in the required vocabulary or select from a non-hierarchical, alphabetically sorted list of a lengthy controlled vocabulary. If a narrative text term is entered, a quick look-up is performed on each entry to try to match it to the controlled vocabulary. If there are any partial matches to the controlled vocabu-

lary the student can select from a list of these. If the narrative text does not match with any of the terms in the controlled vocabulary, the entry is accepted as a non-required problem. When the student finishes entering all of the problems, the student advances to the procedures field. The vocabularies for procedures and their entry in Casebook by the student is analogous to the "problems" field.

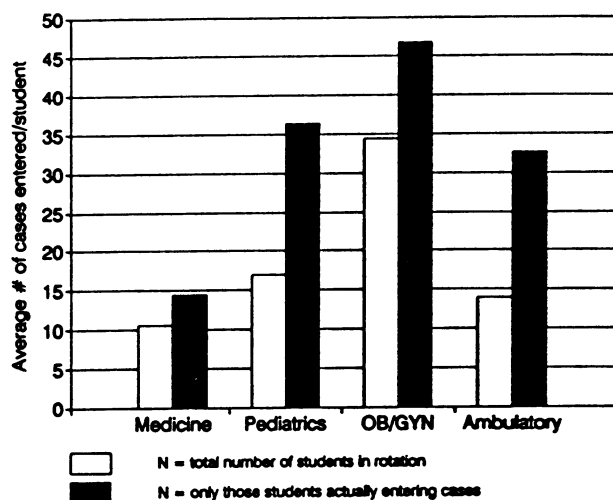


Figure 4

The terms used in the controlled vocabulary for problems were generated by physicians at the MGH Laboratory of Computer Science. Two different strategies were used to select the diagnostic terms to be included. The top 200 discharge diagnoses from each speciality were reviewed and selected when deemed appropriate. In addition, the list of "problems" entered as narrative text over the past year by the students were reviewed and any entries recorded more than 3 times were added to the list. These terms are first screened to see if they would be more appropriate as child terms for the "required" vocabularies before being added to the controlled vocabulary. In order to maintain a rapid system response time, we chose not to add all possible diagnostic terms.

We encountered a number of problems in formulating the controlled vocabulary, most of which related to the number of different ways a particular diagnostic problem could be expressed, e.g., MI, Infarct, Myocardial infarct, AMI, heart attack, etc. This necessitated the creation of a synonym table so that all forms of a word (including common misspellings) are recognized by the system and credit is given, when appropriate, for alternate spellings of a problem.

An additional issue in medical nomenclature relates to the hierarchical relationships of different medical diagnoses, e.g., the term "anemia" subsumes the diagnostic term "pernicious anemia". Originally it was felt

that the students would be satisfied with selecting "anemia" (a required problem) if they saw any type of anemia (predominantly so that they could spend as little time as possible on the computer). It quickly became apparent that they wanted to be as specific as possible and they frequently entered all the different types of anemias that they saw. Because of this the vocabulary was modified to allow a single level of parent-child relationships. This allows the student to select "anemia" and if desired, select from a list of specific anemias. An algorithm was implemented so that if the student selected a more specific term, the student would receive credit for the more general required problem while maintaining the more specific term on the computer screen.

The system not only captures the patient medical record information but also allows the student automatic access to the knowledge base of DXplain - a medical decision support program. The knowledge base of DXplain contains short descriptions and up to date references on over 2000 diseases and 4000 "terms" or findings.

While the student is entering problems, or at a later time, the DXplain linkage can be invoked by highlighting a specific problem and pressing a function key. If an exact match between the Casebook term and a DXplain term is found, then the appropriate disease or term information is displayed. In some cases, e.g., "anemia", DXplain presents a list of the different anemias found in the DXplain database, allowing the student to choose which particular anemia is of greatest interest. The Casebook vocabulary is specifically geared for medical students, so there are instances where no match is possible, e.g., "Periodic health check-up" or "Psychosocial problem". Because of the differences between the two vocabularies, it was necessary to review all of the Casebook vocabulary terms in order to create specific links, where necessary, to DXplain. For example, the Casebook term "Drug overdose" is not a specific disease. However, by sending the word "Toxicity" to DXplain the student is presented with a list of over 50 drugs that could be evaluated for drug overdose. If the student had selected a more specific Casebook term, an exact match might have been made the first time.

STUDENT AND FACULTY PERCEPTIONS

During the early period of Casebook use, student acceptance was less than enthusiastic. The initial design of the data entry screen was complex with many fields; in addition the computers were 8 megahertz 286-based PC's that were too slow for busy medical students. Change is not always welcome, and this new system was felt to add to their responsibilities without any perceived usefulness. Due to space constraints, a major problem at many hospital sites was the inaccessible location of the system, requiring considerable effort by the medical students to

gain access to the appropriate computer to enter information. In some instances, the computers were located in busy conference rooms, or in the departmental offices which were not near the patient care areas and were frequently locked by 5 PM.

The attitude of the faculty members was divided. Although most of the faculty felt that the concept was excellent, and that the resulting information provided by a working system would be most helpful, there was not universal agreement about what information should be collected. Indeed, our experience was that each faculty member was interested in collecting slightly different information. Some felt we collected too little information, some too much, and some felt that most of the information wasn't of great interest to begin with. We have modified Casebook to address each of these problems, and the system continues to gain new adherents over time.

The speed issues were dealt with by requiring all Casebook computers to have a minimum configuration of a 16 megaHertz 386 CPU. The overall length of time for the students to use the system was decreased by paring the amount of information collected. The original fields for primary and secondary diagnosis were merged into a single field "Problems", the distinction between procedures performed and observed was eliminated, and specific information about the place and type of encounter was deemed to be non-essential and therefore removed from the system. The lack of perceived usefulness by some of the faculty supervisors has been harder to deal with. It has been amply demonstrated that if the faculty does not see a need for the system, the students will likely feel they are wasting their time in using the system. At the sites where the faculty go over the data summaries prepared by Casebook with the students, the students are overwhelmingly supportive of the system and feel it is an integral part of the educational process. If the faculty only reviews the statistics at the end of the rotation and then makes corrections for the upcoming rotation, Casebook becomes only an evaluation tool for the faculty. Many students do not perceive such a curriculum planning activity as a high priority. They want to see results for themselves.

The issue of the type and quantity of information to obtain from the students is a continuing source of debate among the faculty. In some institutions, departments had been using a paper-based data collection system for both student and residency teaching evaluations and used the reports from these systems to tabulate the effectiveness of their housestaff and teaching faculty. Since Casebook does not collect information about who taught the student, it cannot provide the information needed for these evaluations. A second point of disagreement is over the definition of what constitutes a case. Some faculty want

the students to enter only actual cases seen - either via direct patient contact or when patients are seen during morning rounds, even if only briefly. Other faculty want to include patients seen more indirectly such as conferences, Grand Rounds, etc. The HMS administration has been very supportive of Casebook and strongly encourages its extension to all of the clinical rotations. The Office of Educational Development at HMS is particularly pleased by the Casebook reports which allow a rapid review of the case mix that students are seeing in the different hospitals. The system has not been in use long enough to evaluate whether any changes will be made secondary to the statistics generated.

FUTURE PLANS

This fall Casebook will be expanded to include the Introduction to Clinical Medicine course given during the second year at Harvard Medical School. This will significantly expand the scope of Casebook and make it an integral part of the student's clinical education.

In order to accommodate the heavy use expected during the ICM course a multi-user version of Casebook will be used. This will allow the students to use any of the HP computers on the Medical Education network to enter their cases. Hopefully, as this network is expanded to the Harvard affiliate hospitals, Casebook will operate as a purely networked program enabling the students to enter their cases from the nearest networked computer instead of relying on a single computer per site.

In the following years it will be expanded to include the remaining core clinical clerkships at HMS. With continued use of Casebook we expect to further enhance and modify it in response to the needs of the Harvard medical community.

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